

microscopical, and it requires very close observation even with the microscope to detect it. It is no wonder, therefore, that planters found it most difficult to decide when and how to apply remedies, and these considerations, together with others incidental to coffee cultivation, rendered a successful treatment, without scientific aid, both difficult and laborious.

When the results of the first experiments at Wallaha were published, the importance of the subject led the Colonial Government to take up further investigations, and to render special scientific aid to the planters in conducting their experiments. Experiments were organised on a large scale, and carried on in various districts throughout the island.

Meetings were also held, in which the development of the disease, and the results of more extended experiments and observations were given in detail.

As a result of this combined activity, a series of reports has lately been presented to the Legislative Council of Ceylon, embodying the results of the "Leaf-disease Inquiry;" these are published in the Sessional papers of this year. The results of the investigations, so far, are briefly summed up as follows:—

1. That the coffee-leaf disease is an organised fungoid growth, present on the estates in some form or other all the year round.

2. That in December and the early part of the year it is generally present as an external parasite upon the coffee trees, in the form of long filamentous threads which cover every part of the bark and leaves.

3. That while an external parasite and in the filamentous stage it is possible to destroy it most effectually, and by so doing to save the trees from the attacks of the fungus for at least one year.

4. That a mixture of sulphur and lime dusted by hand into the tree in the proportions of one of sulphur to two of lime has been found by experiment to be the most effective and suitable remedy which can be applied.

5. That the cost of the materials, at present prices in Colombo, together with the cost of application, will not exceed at the rate of R 16-50 per acre.

6. That the application of sulphur and lime in the proportions recommended, by releasing the trees from a heavy drain upon their resources and restoring them to their natural condition, will be attended by a much more profitable result than any expenditure upon artificial manures.

7. That in order to assist the means used for checking the leaf disease it is most important that planters unite in the application of remedies and that they remove at once all sickly trees on their estates and those not likely to be crop producers, and prevent by every means in their power the re-infection of good coffee.

8. That in order to secure perfect freedom from leaf-disease it will no doubt be necessary to uproot all coffee trees on abandoned estates and old native gardens, and to take steps to prevent the disease from finding an asylum upon any plants not under careful cultivation.<sup>1</sup>

Judging by these results, which have been obtained by the united action of practical men of considerable knowledge and experience in coffee cultivation, aided by careful scientific observation, there is little doubt that the leaf disease can now be very effectually and conveniently treated, and if not completely exterminated, at least so materially reduced that it will not seriously injure the crops.

In the reports just quoted, great prominence is given to the necessity which exists for removing all old and sickly trees and up-rooting coffee plants growing without care or cultivation on abandoned estates and native gardens. Such trees appear to be the worst sufferers from leaf disease, and while they remain, are a continual source of danger to well-cultivated estates. One severely diseased

tree is said to be sufficient to infect all trees in its immediate neighbourhood, and on that account a strong conviction is expressed in the Reports that little good can be expected from remedial measures of any kind, unless great care is taken to prevent the disease finding an asylum on "shuck" and abandoned coffee. The earnestness and intelligence which have characterised the action of the planters during the recent experiments lead to the hope that every means will be taken to check the development of the disease, and to increase the action of suitable remedies. The Reports also recommend the extended cultivation of other plants, such as tea and cinchona, in order to break the continuity of the coffee estates and restrict the action of the disease as much as possible.

On thus reviewing the present condition of coffee cultivation in Ceylon, there is much that is hopeful and satisfactory. Dr. Thwaites in his Report dated March, 1877, remarks that "Notwithstanding the continued prevalence of *Hemileia vastatrix* upon the coffee plants throughout the island, there would appear to be little, if any, diminution in the anxiety to invest in the cultivation of coffee; the high prices obtained, and the beneficial effects of judicious manuring, are giving so much confidence to planters." This feeling appears still to be maintained, for keen competition and high prices characterise all recent sales of suitable forest land. And while this shows that coffee cultivation still possesses the confidence of investors in new districts, many estates even in the oldest districts, are sold at prices which show they possess great vitality, and that where careful and intelligent cultivation is pursued they still offer a promising and attractive investment. It is gratifying to find that the planters are now quite conscious of the true nature of the disease, and thoroughly aroused to the necessity which exists for treating it on the lines which have proved so eminently successful for the last twenty years [with the fungoid pests of the hop and vine.

By the extended cultivation of cinchona, tea, and other products, some of the conditions which have induced, or, at least, encouraged the ravages of the leaf-disease, will doubtless be removed, and in the renewed care and intelligence which are becoming daily more apparent in the methods of cultivation and the application of suitable manures, there is every reason to believe that coffee cultivation in Ceylon will be carried on under much more advantageous circumstances than at present, and while much that is now under coffee will probably be planted with tea and cinchona, the remaining lands will receive that due care and attention which cannot fail in time to restore the coffee estates of Ceylon to the position they have long held as one of the most successful and important of the enterprises of the East.

D. MORRIS

Kew, September 3

#### OUR ASTRONOMICAL COLUMN

THE SATELLITES OF MARS.—In the Introduction to his Tables of the satellites of Uranus, Prof. Newcomb points out the advantage that might be derived, in systematic observations of the satellites by the preparation of a table showing the angles of position and distances corresponding to every 10° in  $\alpha$  or the longitude of the satellite in its orbit, counted from the point in which it crosses the plane parallel to the earth's equator. From such a table the approximate positions of the satellites would be obtainable at any one opposition, with no further calculation than is required to determine the value of  $\alpha$  for the time of observation. The more rapid geocentric motion of the planet Mars does not of course allow of this principle of computation being applied so as to attain the same degree of approximation as in the case of Uranus, but even with Mars it is likely that such a table, prepared with the values of the various auxiliary quantities for the date of opposition November 12, may facilitate observations, and we accordingly present one below:—

<sup>1</sup> Morris's Reports on "Coffee-Leaf Disease," Sessional Papers, Legislative Council of Ceylon, 1879.

Argument $u$ .		Position.		Distance.	
A.	B.	A.	B.	<i>Deimos</i> .	<i>Phobos</i> .
0	180	178°8	358°8	20'4	8'2
10	190	144°5	324°5	16'8	6'7
20	200	109°3	289°3	19'9	8'0
30	210	88°4	268°4	27'3	10'9
40	220	77°0	257°0	35'8	14'3
50	230	70°1	250°1	44'2	17'7
60	240	65°3	245°3	51'6	20'7
70	250	61°4	241°4	57'7	23'1
80	260	58°4	238°4	62'3	25'0
90	270	55°6	235°6	65°2	26°1
100	280	53°1	233°1	66°2	26°5
110	290	50°5	230°5	65°1	26°2
120	300	47°8	227°8	62°6	25°1
130	310	44°8	224°8	58°0	23°3
140	320	41°1	221°1	52°1	20°9
150	330	36°4	216°4	44°8	17°9
160	340	29°6	209°6	36°5	14°6
170	350	18°7	198°7	27°9	10°6
180	360	358°8	178°8	20°4	8°2

According to Prof. Newcomb's elements the values of the argument  $u$  at Greenwich mean midnight are—

Nov. 2 ... ..	<i>Deimos</i> 331°1	<i>Phobos</i> 89°8
12 ... ..	" 302°7	" 217°7
22 ... ..	" 274°4	" 345°7

and the diurnal motions of  $u$  are  $285^{\circ}1645$  and  $1128^{\circ}794$  for *Deimos* and *Phobos* respectively, giving hourly motions of  $11^{\circ}882$  and  $47^{\circ}033$ , whence  $u$  for the time of observation may be found. Or if the observer possesses Newcomb's memoir on the satellites he may find it from the table at p. 42. Then with  $u$  as the argument the above table gives roughly the angle of position and distance of the satellite, remarking that the former is to be taken in column A or column B, according as the argument is found under A or B. Thus for midnight on November 5 the value of  $u$  for *Deimos* is  $106^{\circ}6$ , and for *Phobos*  $236^{\circ}3$ , whence the positions and distances are: for *Deimos*  $51^{\circ}$  and  $65''$ , and for *Phobos*  $247^{\circ}$  and  $20''$ .

THE SATURNIAN SATELLITE, MIMAS.—This faint object was observed by Mr. A. Ainslie Common, of Ealing, with his 3-feet reflector, on the night of September 21, when close up to its conjunction with the following extremity of the ring, which was estimated to take place about 11h. 50m. G.M.T. With the elements which have been previously used in this column the satellite would be up to the ring at 11h. 53m. Such observations as this are of course much more valuable for the correction of elements than estimations of the times of greatest elongations; nevertheless as it is in or near the latter positions that the satellite is most likely to be visible in telescopes of inferior power, we subjoin the times of greatest elongations observable in this country up to the end of the present month:—

EAST.		WEST.	
Oct. 9 ...	h. m. 12 20	Oct. 16 ...	h. m. 13 56
10 ...	10 56	17 ...	12 33
11 ...	9 53	18 ...	11 10
12 ...	8 10	19 ...	9 47
13 ...	6 47	20 ...	8 23
		21 ...	7 0
24 ...	14 10	Nov. 2 ...	12 58
25 ...	12 47		
26 ...	11 24		
27 ...	10 0		
28 ...	8 37		
29 ...	7 14		

THE MINOR PLANETS.—Two small planets assumed to be new have been detected by Prof. Peters, of Clinton, N.Y., apparently on September 22 and 26 respectively; the number being thus raised to 203. Prof. Watson, now

in direction of the Washburn Observatory, Madison, Wisconsin, has selected the following names for planets discovered by him in 1877: for 174, *Phædra*; for 175, *Andromache*; and for 179, *Clytemnestra*. *Fortuna* will be in opposition on October 23 close up to perihelion, so that the possible brightness,  $8.5m$ , will be at its maximum.

### GEOGRAPHICAL NOTES

DR. HOLUB, the eminent African traveller, who is now in England on his way to his native country (Bohemia), intends, it is stated, shortly to undertake another exploring expedition. His return to Europe has for its main object the collection of the necessary funds for the new undertaking. He has formed plans for the formation of an international expedition, which is to be placed under his direction and which is to travel through Africa from Port Elizabeth towards Egypt. The exploring party is to consist of twelve members representing twelve different nations, and the costs of the expedition are to be defrayed by the different governments. The special purpose of the expedition is stated to be the opening of Central Africa towards the south and east and to facilitate the colonisation of the district between the Vaal River and the Zambesi. A correspondent in the *Times* gives the following interesting summary of the remarkable work accomplished by Dr. Holub:—"For seven years Dr. Holub has been exploring the country north and south of the Zambesi, alternating his exploring expeditions with months spent at the Diamond-fields, practising as a medical man to raise the requisite funds for his next journey. In this time the doctor has studied the habits of the Matabele, the Marutsi, Hottentots, Bechuanas, and numerous other tribes, living among them as their guest, and gaining their confidence by curing their sick. In Dr. Holub's third and last journey he has accurately surveyed the country from the Diamond Fields to the Zambesi, and the Zambesi from its junction with the Chobe to the Barotse country. His map of the Zambesi is on a large scale, and shows every island, creek, and rapid. To show the difficulties of this survey, it may be mentioned that, owing to the loss of his *Nautical Almanac*, his sextant was useless, and the bearings had to be taken by compass observations every 300 yards, while the distances, amounting in the various surveys to over 2,000 miles, were determined by *stepping*. That is, the explorer counted every step he took during a twenty-one months' walk. He arrived at Muchela Amsinga tired and unwell, but still full of pluck, and hoping to cross the continent and emerge at Loanda. Then fever came on, and his best canoe, containing all his gunpowder, and, worse than all, his quinine, sank in a rapid. He still pushed on, but at the Nambwe cataract he succumbed, and was carried back insensible by his native servants to lie ill during a period of sixteen months. Even during his illness, however, he was not idle, for being carried about in a litter and directing his men what to pick up, he made magnificent collections of plants and insects, with others of birds, weapons, native drawings, &c. The collection of beetles alone contains no less than 13,000 specimens. Dr. Holub is publishing the account of his journeys in Bohemian, English, German, and French, and is about to read a paper before the Geographical Society of Vienna. He will also read one before the Royal Geographical Society of London when he returns to England at Christmas."

DR. OTTO FINSCH, of Bremen, who is on a tour to Micronesia, by order of the Humboldt Institution of Berlin, arrived at Honolulu on June 17, and first of all proceeded to the island of Maui, where he spent some time in making scientific collections and observations of the Haleakala, the largest volcanic crater on the globe. After his return from Maui he made an excursion to the Bay of Waimanolo in order to visit the ancient Hawaiian